Policy Brief 06
06____JUNE 2020
RESEARCH PROGRAMME
CROSSING BORDERS
LISER
LUXEMBOURG INSTITUTE OF SOCIO-ECONOMIC RESEARCH

Recovering from the Covid-19 crisis

Insights from an *Epidemionomic* Approach

Michał Burzyński and Frédéric Docquier, *LISER, Luxembourg*

Managing the Covid-19 crisis is often perceived as finding the right balance between saving lives and saving the economy or, to put in crude terms, between epidemiologists and economists' priorities. The problem is more subtle and complex. In many countries such as Luxembourg, lockdown and social distancing measures were perceived as necessary to flatten the infection curve and to avoid a public health disaster… at the cost of a sizeable cut in economic output. Nothing could be less certain as a collapse of the health care system alone could have generated panic, a systemic crash of the whole international debt network, and an even more severe economic recession. As policymakers have been implementing many measures to restart the economy, the fear of a painful tradeoff recurs. Again, this view overlooks the fact that creating wealth is necessary to fund our health care system, to avoid systemic bankruptcies, and to limit the indirect effects that economic damages inflicted by the lockdown have on mental health and human lives. Now that the virus transmission rates have reached very low levels, this is a good time for lifting containment measures. Sound governance of the *deconfinement plan* requires anticipating the risk of a rebound in the infection curve and identifying appropriate accompanying measures. In this context, collaborative research by economists and epidemiologists is more relevant than ever to highlight the costs and benefits of public actions.

An *Epidemionomic* Model for Luxembourg

Within the *Task Force for the Coordination of the Public Research Sector in the Context of the Covid-19 Pandemic*, economists and epidemiologists have developed a new model that links the economic and epidemiological economic aspects of the Covid-19 crisis. Individuals and firms' behaviors are not micro-founded, but embedded in scenarios. Parameterized on the Luxembourg's economy and accounting for cross-border labor movements within the Greater Region, this model is used to *nowcast* and *forecast* the public health and economic effects of the crisis week after week throughout 2020.

The economic block of the model relies on the input-output (I/O) tables of Luxembourg. This I/O structure accounts for linkages between national industries and the rest of the world. The standard I/O model is used to formalize how industry-specific demand shocks are spreading within the national economy, under the implicit assumption that each sector can respond to the rising/declining demand from the other sectors and from final consumers by producing more/less. Employment is the variable of adjustment that firms use to respond to demand shocks. When modeling the effect of the Covid-19 crisis and of lockdown measures, the standard I/O model must be enriched with supply-side constraints of different kinds: (i) workers who are infected by

Michal Burzyński is an economist affiliated with the Labor Market Department. He specializes in international economics, with a focus on international migration and its impact on labor markets, growth and international trade.

Frédéric Docquier is Research Program Leader on Crossing Borders at LISER, and Professor of Economics at the Université catholique de Louvain. His research interests are in economics of migration, quantitative development theory, economic growth.

Contact:
michal.burzynski@liser.lu
frederic.docquier@liser.lu

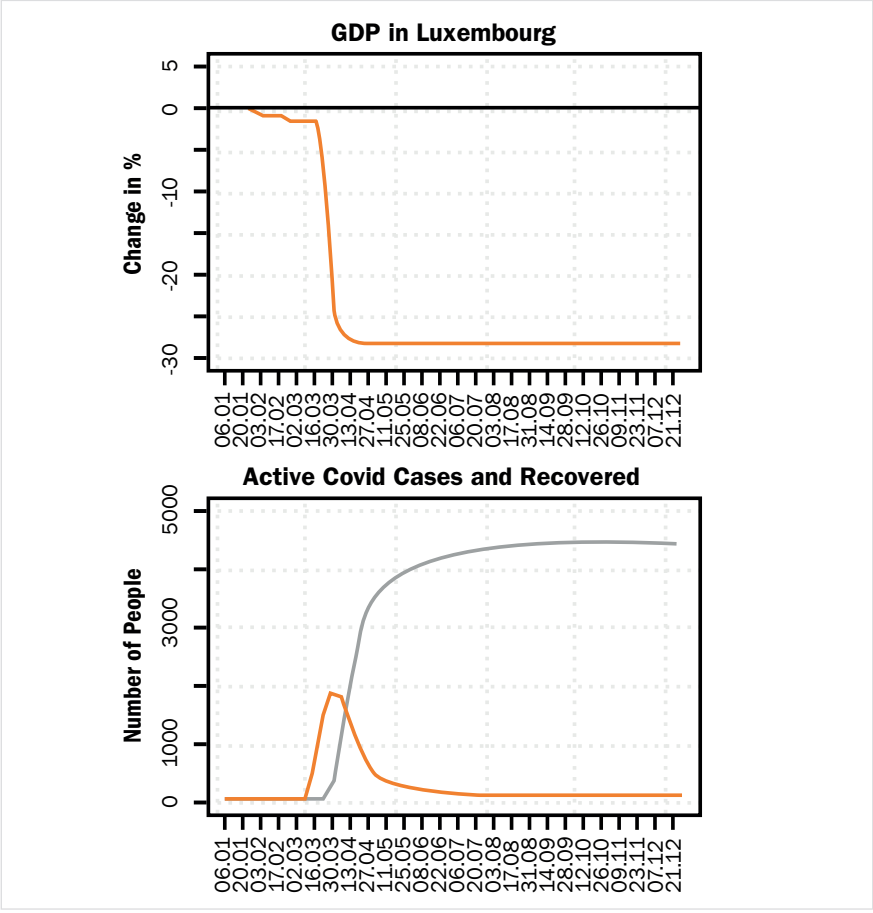
Covid-19 and symptomatic cannot supply labor; (ii) school closures imply that many workers are forced to take parental leave; (iii) containment measures reduce the permitted level of employment in lockdown industries. The parameterized economic block not only matches the economic structure observed before the crisis, but also matches post-lockdown data obtained from administrative sources (ADEM, IGSS, etc.) and from firm-level surveys (Chamber of Commerce and Chambre des Métiers).

The epidemiological block decomposes the industry-specific labor force into sixteen groups, involving four regions of residence (Luxembourg, Grand-Est, Wallonia, and Rhineland-Palatinate/ Saarland) and four infection groups (susceptible, infected and symptomatic, infected and asymptomatic, and the recovered). The evolution of these stocks is governed by virus transmission rates on the job and in the place of residence. The contamination process depends on workers' time spent at the workplace and outside the labor market, as well as on the proportion of infectious people and on prevention measures (say, social distancing, wearing masks and hygiene measures) in those places. Time allocation is "endogenously" governed by employment rates as well as by parental leave and teleworking practices. As for the share of infectious employees in the workplace, it depends on public health policies such as testing or contact tracing. The epidemiological block is parameterized to (almost perfectly) fit the industry-specific infection curves observed in Luxembourg and in the Greater Region between the beginning of March and the end of May

Nowcasting the effect of the lockdown

The Covid-19 crisis has drastically affected the Luxembourg's economy, as shown on the top panel of Figure 1. In the pre-lockdown phase of the crisis, the gradual deterioration of the global economy generated a decrease in activity that converges to 3.0%. Then, between March 16 and 20, lockdown measures induced an additional cut of about 25%. Hence, each week of lockdown reduced national output by 28% (and annual GDP by 0.54%). Assuming containment measures had not been lifted before the end of the year, the aggregate GDP loss over the entire year would have been around 22%. The most adversely affected industries would have been *Construction* (-66%), HORESCA (-62%) and *Wholesale and Retail Trade Services* (-42%). The least impacted sectors would have been *Health and Social Work* (-3%) and *Finance* (-6%), *Education and Public administration* (-10%).

Figure 1: The permanent lockdown scenario



The bottom panel of Figure 1 shows that the lockdown has limited the spread of the virus. Between March 20 and 31, transmission rates decreased drastically. As a result, the peak of the infection curves was observed during the first week of April with around 1,900 detected active Covid cases (excluding asymptomatic people who were not detected as positive). Without restarting the economy, the proportion of infected people would have reached zero by mid-June, with a number of recovered symptomatic people of around 4,400 individuals. Assuming the same number of asymptomatic cases, the proportion of immune people would have reached 1.4% of the population only. As of May 11, the infection curve was close to zero, which suggests that it was a good time for lifting containment measures.

In an economy heavily relying on skill-intensive services, the role of teleworking has been instrumental to limiting the weekly economic output loss and the propagation of the virus in Luxembourg. Had teleworkers been unemployed, the economic cost of each week of lockdown would have been 23 percentage points greater (i.e. 51% instead of 28%). Alternatively, if teleworkers had been employed at their workplace, the infection curve would not have decreased before the end of the year and a second peak would have been observed.

Time for lifting economic containment measures…

There is a big deal of uncertainty about the effect of restarting activities on industry-specific transmission rates as well as on the transmission rates outside the labor market. Lifting containment measures implies an increase in the rate of presence of workers at the workplace, where exposition to the disease differs from that prevailing in the place of residence. This "mechanically" influences the average transmission rate through the *extensive margin* (i.e., through workers' time allocation between the workplace and home). In addition, a higher density of employees in the workplace might change the type and frequency of social interactions as well as the level of physical distancing, influencing industry-specific transmission rates through the *intensive margin*. To illustrate the importance of the intensive margin, we consider three values for the elasticity of transmission rates to the density of workers at the workplace, i.e. x=(0.0, 0.2, 0.4), in each industry.

We investigate separately and jointly the effects of several deconfinement measures – restarting the construction sector, gradual reopening of schools, reopening of the other industries, reopening HORESCA – under the three intensive-margin scenarios. Considering the deconfinement measures of April and May, we unsurprisingly find that restarting all sectors would have huge effects on the economy and no effect on the aggregate infection curve when x=0.0. Remember that this scenario implies that post-lockdown changes in transmission rates – resulting from social distancing, hygiene and prevention measures – are permanent. In contrast, a rebound in the infection curve is obtained with x=0.4. However, this pessimistic scenario is unlikely to materialize, as it would have implied a rapid explosion in the number of Covid cases in the construction industry, something we have not observed in the data. Interestingly, the median scenario with x=0.2 also predicts a gradual decline in the number of Covid cases, in line with the past data. We consider this intermediate intensive-margin scenario as a prudent and plausible one.

Can Luxembourg proceed a step further with its economic deconfinement? Excluding the (over-)pessimistic intensive-margin scenario with x=0.4, we study the effect of a further

deconfinement scenario involving a full or a partial restarting of the HORESCA sector in the beginning of June. We also assume a gradual recovery of exports, which might be over-optimistic from the economic perspective. As shown in Figure 2 (top panel), the effect on weekly GDP converges towards -1.5%, implying that the economy almost gets back to normalcy. As far as the infection curve is concerned, the effect is negligible under x=0, whereas a rebound can be expected under x=0.2 in the absence of PCR testing. In the latter scenario, the epidemiological response is negligible until the beginning of July but then, the infection curve exhibits a strong rebound with a new peak at 1,000 detected Covid cases by mid-December. Yet, two positive messages can be emphasized here. Firstly, testing on the first day of each month prevents the rebound. Secondly, additional simulation show that the infection curve converges toward zero under a partial restarting of HORESCA activities. Reopening hotels and restaurants at half of their capacity or with equivalent physical distancing measures appears to be a highly relevant and safe policy option.

Importantly, additional results show that bringing back all teleworkers to their workplace induces larger epidemiological damages, even in the optimistic scenario with x=0. Combined with the full restarting of HORESCA, the cessation of teleworking activities has limited effects on GDP, and drastic effects on the infection curves.

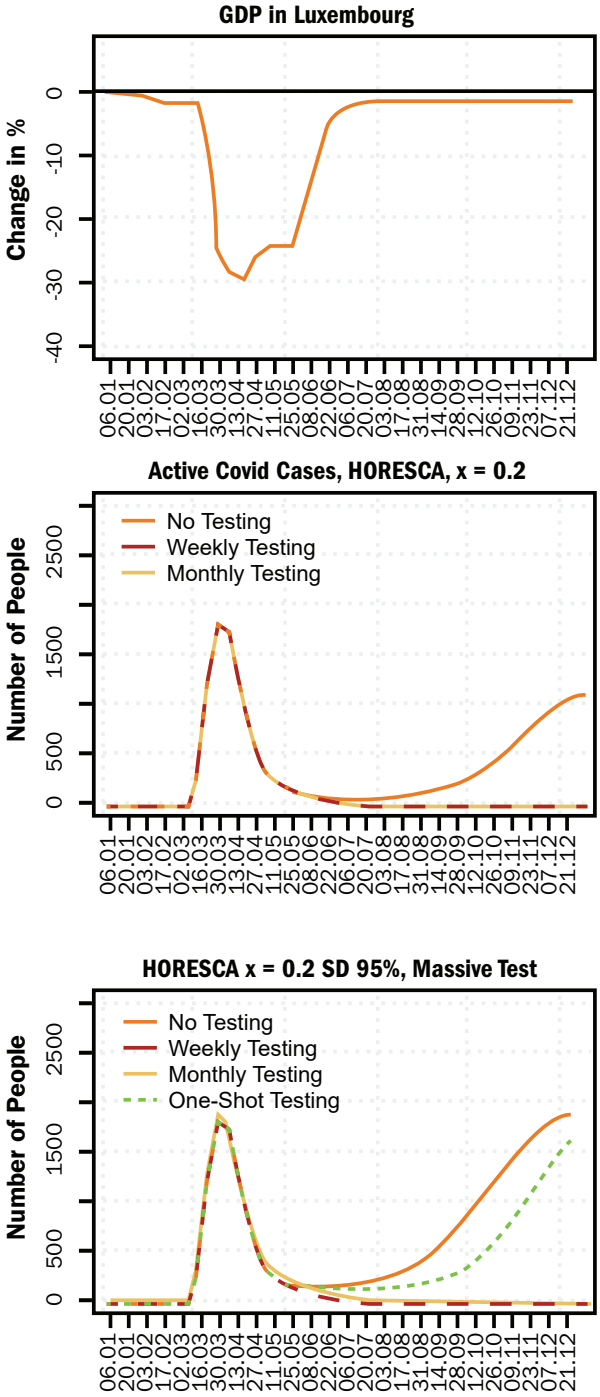


Figure 2:
Deconfinment scenarios

Meals, parties, vacation leaves…

Physical distancing measures have drastically affected leisure, family and social life. Many daily interactions among family and friends have moved to messaging platforms. Most sport, culture and entertainment events have been cancelled. As the lockdown weeks turn into months, frustrations and impatience mount and people long for a return to a more normal social life. It is worth investigating the effect of relaxing constraints on social activities outside the labor market. In line with our intensive-margin scenarios – which link on-the-job transmission rates to the density of employees at the workplace – we allow transmission rates at the place of residence to partly return to their initial level once social life restarts. Starting from the HORESCA deconfinement scenario with x=0.2, the bottom panel of Figure 2 shows the evolution of the infection curve when the post-lockdown fall in transmission rates outside the labor market is reduced by 5% compared to the benchmark (and starting in the beginning of June). As the transmission rate fell from 5 to 0.25 after the lockdown, this means that the resumption of social life leads to a new transmission rate at the place of residence which is twice as large as the current one.

In the absence of tracing or testing measures, a rebound in the infection curve is obtained. It is however reassuring that monthly PCR tests can be used to prevent the rebound. However, to be fully effective, it is important to emphasize that all workers, nationals and cross-border commuters, should be tested at the same frequency. Additional simulation results reveal that restricting the same tests to nationals only is not enough to prevent a slow and gradual rebound in the infection curve.

Policy lessons from the model

Given the trends observed during recent weeks, we can be relatively optimistic that most economic deconfinement measures will not generate a relapse of the pandemic. However, the resumption of social life and, to a lesser extent, the reopening of HORESCA activities generate more uncertain effects. To avoid a rebound in the infection curve, five recommendations can be drawn from our analysis:

- Maintaining teleworking practices is vital. All of our simulation results indicate that a cessation of teleworking practices induces large epidemiological damages, even if drastic mitigation policies are implemented.

- Reopening HORESCA activities at half of their full capacity or with equivalent distancing measures generates very small effects on the infection curve and appears to be a very relevant policy option.

- Our results also indicate that the evolution of the number of Covid-cases is highly sensitive to reproduction numbers outside the labor market. Maintaining physical distancing and hygiene measures in social and family contexts has an important impact on the dynamics of the pandemic.

- Monthly PCR testing of national and cross-border workers are sufficient (perhaps not necessary) to prevent a rebound in the infection curve.

- Finally, combining testing with phone-app contact tracing and quarantining measures would reduce the reproduction rate below that of testing policies alone combining testing with contact

tracing would allow reducing the required frequency of testing (e.g., a test every two of three months is likely to be sufficient).

These five recommendations strongly limit the risk of relapse. Being in unchartered territory, there is no guarantee that our pessimistic scenario is the worst-case one. Hence, these accompanying measures might need to be tightened if infection rates are increasing more rapidly until a vaccine is widely available. Alternatively, they might be relaxed if a higher fraction of recent distancing and prevention behaviors prove to be permanent and sustainable. We see our accompanying measures as safe recommendations in the direct aftermath of the deconfinement phase.

This policy brief is based on Burzyński, M., J. Machado, A. Aalto, M. Beine, T. Haas, F. Kemp, S. Magni, L. Mombaerts, P. Picard, D. Proverbio, A. Skupin, F. Docquier (2020). Covid-19 Crisis Management in Luxembourg: Insights from an Epidemionomic Approach. Manuscript.

LISER
LUXEMBOURG INSTITUTE OF SOCIO-ECONOMIC RESEARCH

Luxembourg Institute of Socio-Economic Research (LISER)
Campus Belval | 11, Porte des Sciences | L-4366 Esch-sur-Alzette
www.liser.lu